

**Intellectual Property
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November 30, 2005

Mail Stop 16
Director of the U.S. Patent and Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450
Attn: Refunds Department

Via Facsimile: 571-273-6500

Re: U.S. Patent Application No: 10/015,326
IPTL File No: 2771-515
IPTL Deposit Account No. 083284

Dear Sir/Madam:

On November 10, 2005, IPTL submitted a Request for Continued Prosecution, Preliminary Amendment, and Request for a One-Month Extension in response to the Advisory Action issued on October 11, 2005 for the above identified U.S. application. This Request was accompanied by a credit card authorization form in the amount of \$910.00 (\$790 for the RCE, and \$120 for the one-month extension fee under 37 CFR 1.136).

On November 18, 2005, Deposit Account 083284 was charged an additional amount of \$900.00 for a three-month extension fee.

As you can see from the attached copy of the Response, the one-month extension fee of \$120 was authorized due to the fact that Applicant filed a response within two months of receiving the Final Office Action and the Patent Office responded to the applicants' response by issuing an Advisory Action on October 11, 2005 which ended the three month statutory period. (see page 8, entitled "Petition for Extension and Fees Payable" for further details).

We therefore respectfully request the Commissioner for Patents to refund the additional charge of \$900.00 to Deposit Account No. 083284.

Sincerely,

**INTELLECTUAL PROPERTY/
TECHNOLOGY LAW**


Joyce Geyirtzman

/jg
Encl.

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Patent Application
ATM-515 (7486)**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

In re United States Patent Application of:

Applicant: XU, Chongying, et al.

Application No.: 10/015,326

Date Filed: December 13, 2001

Title: **METHOD FOR REMOVAL
OF IMPURITIES IN CYCLIC
SILOXANES USEFUL AS
PRECURSORS FOR LOW
DIELECTRIC CONSTANT
THIN FILMS**

Docket No.: ATMI-515 (7486)

Examiner: Virginia MANOHARAN

Art Group: 1764

Confirm. No.: 2946

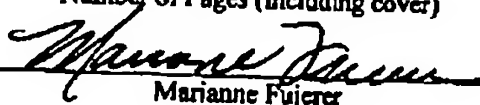
Customer No.:

25559**FACSIMILE TRANSMISSION CERTIFICATE**ATTN: Examiner Virginia MANOHARANFax No.: (571) 273-8300

I hereby certify that this document is being filed in the United States Patent and Trademark Office, via facsimile transmission to Mail Stop RCE, Commissioner for Patents, PO Box 1450, Alexandria, VA 22313-1450, on November 10, 2005, to United States Patent and Trademark Office facsimile transmission number (571) 273-8300

11

Number of Pages (including cover)


Marianne Fuierer

November 10, 2005

Date

COPY

**REQUEST FOR CONTINUED PROSECUTION, PRELIMINARY AMENDMENT, REQUEST
FOR A ONE MONTH EXTENSION IN UNITED STATES PATENT APPLICATION NO.
10/015,326**

Mail Stop RCE
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

In response to the October 11, 2005 Advisory Action, a Request for Continued Examination is appended hereto and the claims are amended as follows:

In the Claims

1. (Currently amended) A process for improving delivery reproducibility of a cyclosiloxane precursor to a chemical vapor deposition reactor and reducing water content in the cyclosiloxane precursor ~~to a level that minimizes premature polymerization in transport to the chemical vapor deposition reactor, the process~~ comprising the steps of:
 - (a) providing a cyclosiloxane precursor;
 - (b) treating and contacting ~~said~~ the cyclosiloxane precursor with at least one adsorbent bed material that has an affinity for water and at least one impurity selected from the group consisting of acidic and basic impurities from said cyclosiloxane precursor for a sufficient time to reduce the water and impurities in the cyclosiloxane precursor ~~to a level that minimizes premature polymerization; and~~
 - (c) separating ~~a~~ the purified cyclosiloxane precursor from the at least one adsorbent bed material, to produce a purified cyclosiloxane precursor, wherein the water content is less than 20 ppm;
 - ~~(e)~~ (d) vaporizing ~~said~~ the purified cyclosiloxane precursor; and
 - ~~(d)~~ (e) delivering vapor of ~~said~~ the purified cyclosiloxane precursor to said chemical vapor deposition reactor, wherein treatment of the cyclosiloxane precursor functions to prevent or minimize premature polymerization of ~~said~~ the cyclosiloxane precursor in the chemical vapor deposition reactor and associated delivery lines and improves delivery reproducibility of the cyclosiloxane precursor.
2. (Cancelled).
3. (Previously presented) The process according to claim 1, wherein said at least one impurity is acidic.
4. (Previously presented) The process according to claim 1, wherein said at least one impurity is basic.
5. (Currently amended) The process according to claim 1, wherein the said cyclosiloxane precursor comprises the formula $[RR'Si-O]_n$, wherein each of R and R' is same or different and

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independently selected from the group consisting of hydrogen, hydroxyl, C₁-C₈ alkyl, C₁-C₈ alkoxy, C₁-C₈ alkene, C₁-C₈ alkyne, and C₁-C₈ carboxyl; and n is from 2 to 8.

6. (Original) The process according to claim 1, wherein the cyclosiloxane precursor is selected from the group consisting of polyhedral oligomeric silsesquioxanes (POSS), octamethylcyclotetrasiloxane (OMCTS), hexamethylcyclotetrasiloxane (HMCTS), tetramethylcyclotetrasiloxane (TMCTS), and mixtures thereof.
7. (Original) The process according to claim 1, wherein the cyclosiloxane precursor is 1,3,5,7-tetramethylcyclotetrasiloxane.
- 8.-9. (Cancelled).
10. (Currently amended) The process according to claim 1, wherein the at least one said adsorbent bed material is selected from the group consisting of: silica gel, molecular sieves, aluminum oxide, carbon, calcium oxide, calcium chloride, sodium sulfate, magnesium perchlorate, phosphorus pentoxide, silicide, metals, and metal hydrides.
11. (Currently amended) The process according to claim 10, wherein the at least one adsorbent bed material is calcium oxide.
12. (Currently amended) The process according to claim 10, wherein the at least one adsorbent bed material is calcium hydride.
13. (Currently amended) The process according to claim 10, wherein the at least one adsorbent bed material comprises a combination of adsorbents.
14. (Previously presented) The process according to claim 10, wherein the cyclosiloxane precursor is further contacted with a second adsorbent bed material.
15. (Currently amended) The process according to claim 10, wherein said the purified cyclosiloxane precursor is removed from the at least one said-adsorbent bed material by distillation.

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16. (Currently amended) The process according to claim 10, wherein ~~said~~ the purified cyclosiloxane precursor is removed from the at least one said adsorbent bed material by decantation.
17. (Currently amended) The process according to claim 10, wherein ~~said~~ the purified cyclosiloxane precursor is removed from the at least one said adsorbent bed material by pump.
18. (Currently amended) A process for improving delivery reproducibility of a cyclosiloxane precursor to a chemical vapor deposition reactor by reducing water content and impurities in the cyclosiloxane precursor, the process comprising the steps of:
(a) providing a cyclosiloxane precursor;
(b) treating and contacting the cyclosiloxane precursor with at least one adsorbent bed material that has an affinity for water and at least one impurity selected from the group consisting of acidic and basic impurities from said cyclosiloxane precursor for a sufficient time to reduce the water and impurities in the cyclosiloxane precursor; and
(c) separating the cyclosiloxane precursor from the at least one adsorbent bed material, to produce a purified cyclosiloxane precursor ~~The process according to claim 1, wherein said purified cyclosiloxane precursor comprises < 0.001% of the at least one impurity.~~
19. (Currently amended) A process for improving delivery reproducibility of a cyclosiloxane precursor to a chemical vapor deposition reactor by reducing water content and impurities in the cyclosiloxane precursor, the process comprising the steps of:
(a) treating and contacting the cyclosiloxane precursor with at least one adsorbent bed material that has an affinity for water and at least one impurity selected from the group consisting of acidic and basic impurities from said cyclosiloxane precursor for a sufficient time to reduce the water and impurities in the cyclosiloxane precursor; and
(b) separating the cyclosiloxane precursor from the at least one adsorbent bed material, to produce a purified cyclosiloxane precursor ~~The process according to claim 1, wherein said purified cyclosiloxane precursor comprises < 0.00001 % of the at least one impurity.~~
20. (Cancelled).
21. (Currently amended) A process for improving delivery reproducibility of a cyclosiloxane precursor to a chemical vapor deposition reactor by reducing water content in the cyclosiloxane precursor, the process comprising the steps of:

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(a) treating and contacting the cyclosiloxane precursor with at least one adsorbent bed material that has an affinity for water and at least one impurity selected from the group consisting of acidic and basic impurities from said cyclosiloxane precursor for a sufficient time to reduce the water and impurities in the cyclosiloxane precursor; and

(b) separating the cyclosiloxane precursor from the at least one adsorbent bed material, to produce a purified cyclosiloxane precursor ~~The process according to claim 1,~~ wherein said purified cyclosiloxane precursor comprises less than 0.001% of water.

22- 46. (Canceled).

REMARKS

Applicants have amended claims 18, 19 and 21 thereby placing them in conditions for allowance.

Rejection under 35 U.S.C. §103(a)

The rejection of claims 1, 3-7, 9-17 was maintained under 35 U.S.C. §103(a) as being unpatentable over McEntee, et al. (U.S. Patent No. 4,127,598, hereinafter McEntee) and Tsukuno, et al. (U.S. Patent No. 5,312,947, hereinafter Tsukuno).

This rejection is hereby traversed, and reconsideration of the patentability of herein amended claims is requested, in light of the ensuing remarks.

Claim 1 has been amended as set forth below:

1. A process for improving delivery reproducibility of a cyclosiloxane precursor to a chemical vapor deposition reactor and reducing water content in the cyclosiloxane precursor, the process comprising the steps of:
 - (a) providing a cyclosiloxane precursor;
 - (b) treating and contacting said the cyclosiloxane precursor with at least one adsorbent bed material that has an affinity for water and at least one impurity selected from the group consisting of acidic and basic impurities from said cyclosiloxane precursor for a sufficient time to reduce the water and impurities in the cyclosiloxane precursor;
 - (c) separating the cyclosiloxane precursor from the at least one adsorbent bed material, to produce a purified cyclosiloxane precursor, wherein the water content is less than 20 ppm;
 - (d) vaporizing said purified cyclosiloxane precursor; and
 - (e) delivering vapor of said purified cyclosiloxane precursor to said chemical vapor deposition reactor, wherein treatment of the cyclosiloxane precursor functions to prevent or minimize premature polymerization of said cyclosiloxane precursor in the chemical vapor deposition reactor and associated delivery lines and improves delivery reproducibility of the cyclosiloxane precursor.

Initially, as mentioned previously, an important and unobvious aspect of the Applicants' invention resides in the discovery or recognition of the source of the cyclosiloxane premature polymerization problem occurred during CVD process, i.e., the presence of trace amount of water, basic and/or acidic

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impurities in the cyclosiloxane precursors, causing the catalytic polymerization thereof.

Therefore, the inquiry of obviousness in this case must be directed to the question of whether or not such a recognition would have been obvious to one of ordinary skill in the art prior to Applicants' invention, without the benefit of hindsight of Applicants' own disclosure in the instant specification, consistent with the court's holdings in *In re Roberts and Burch*, 176 USPQ 313, 314 (CCPA 1973) and *In re Spinnoble*, 160 USPQ 237, 243 (CCPA 1969).

None of the references cited by the Examiner even contemplates the premature polymerization problem associated with chemical vapor deposition of cyclosiloxane precursors, much less than recognizing presence of water, basic and/or acidic impurities therein as the source of such premature polymerization problem. Further, none of the cited references, alone or in combination, teaches or suggests each and every element of claim 1, and as such, do not meet the necessary requirements for rendering the presently claimed invention as obvious.

The McEntee reference only discloses removal of non-acidic and non-basic impurities, such as biphenyls, chlorinated biphenyls, vinyl chloride, carbon tetrachloride, and aromatic hydrocarbon impurities (see McEntee, column 4, lines 39-50), from impure silanes and siloxanes, which include cyclosiloxanes (see McEntee, column 5, lines 26-34). There is no discussion relating to the removal of water or the advantages thereof.

Importantly, the Tsukuno reference relates to polysiloxanes that have already been polymerized. This is in contrast to applicants' claim invention that recites a precursor. There is a difference between a precursor siloxane and polysiloxanes that are already polymerized. All the examples and discussion in the Tsukuno text relate to purification process only after polymerization. Thus, as stated above, this reference does not even contemplate the premature polymerization problem associated with chemical vapor deposition of cyclosiloxane precursors, much less than recognizing a solution. By the time, Tsukuno addresses the issue of ionic crystal removal by the addition of water, polymerization has occurred. Thus, Tsukuno is not relevant to the present invention.

There is no suggestion or motivation to combine the teachings of Tsukuno with McEntee and even if they were combinable, which of course they are not, the proposed combination would not teach or suggest each and every claimed element of the present invention. Where in the references is there any teaching or

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suggestion that reduce the water content to less than 20 ppm would remove the polymerization problem that the applicants are overcoming. Clearly there is none.

As stated above, the Office seems to be merely reinterpreting the prior art in light of applicant's disclosure, in order to reconstruct applicant's claimed invention, but without any instructional or motivating basis in the references themselves. Such approach is improper and legally insufficient to establish any *prima facie* case of obviousness. As such, applicants request the withdrawal of the obviousness rejection.

Petition for Extension and Fees Payable

Applicants are requesting a one-month extension under 37 CFR 1.136 and have included the required fee of \$120.00. A one month extension is due because applicants filed their response on July 25, 2005, two months after the issuance of the Final Rejection of May 25, 2005. The Office did not respond to applicants' response until October 11, 2005, and this late date after the three-month period starts the clock for extension fees. Applicants thus have included the fee for a one-month extension.

Applicants have added three new independent claims. However, in the process of prosecuting this application, applicants have cancelled 29 claims, three of which were independent claims, namely, claims 30, 45 and 46. Thus, no new fees are due for adding these additional claims.

The fee of \$790.00 for the Request for Continued Examination submitted herewith under the provisions of 37 CFR §1.114 and the one-month extension of \$120.00 is authorized to be charged in the attached credit card authorization form.

Authorization hereby is given to charge any deficiency or any additional amount payable in connection with this Request for Continued Examination to Deposit Account No. 08-3284 of Intellectual Property/Technology Law.

Conclusion

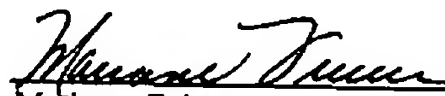
Applicants have satisfied the requirements for patentability. All pending claims are free of the art and fully comply with the requirements of 35 U.S.C. §112. It therefore is requested that Examiner Manoharan reconsider the patentability of all pending claims in light of the distinguishing remarks herein, and

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withdraw all rejections, thereby placing the application in condition for allowance. Notice of the same is earnestly solicited. In the event that any issues remain, Examiner Manoharan is requested to contact the undersigned attorney at (919) 419-9350 to resolve same.

The Office is hereby authorized to charge any additional fees determined to be properly payable for entry of this Response, to Deposit Account 50-0860 of Advanced Technology Materials, Inc.

Respectfully submitted,



Marianne Fuierer
Reg. No. 39,983
Attorney for Applicants

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REQUEST FOR CONTINUED EXAMINATION (RCE) TRANSMITTAL

Address to:
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Alexandria, VA 22313-1450

| | |
|------------------------|--------------------|
| Application Number | 10/015,328 |
| Filing Date | December 13, 2001 |
| First Named Inventor | Chongying Xu |
| Art Unit | 1764 |
| Examiner Name | Virginia Manoharan |
| Attorney Docket Number | ATMI-515 (7486) |

This is a Request for Continued Examination (RCE) under 37 CFR 1.114 of the above-identified application. Request for Continued Examination (RCE) practice under 37 CFR 1.114 does not apply to any utility or plant application filed prior to June 8, 1995, or to any design application. See Instruction Sheet for RCEs (not to be submitted to the USPTO) on page 2.

1. **Submission required under 37 CFR 1.114** Note: If the RCE is proper, any previously filed unentered amendments and amendments enclosed with the RCE will be entered in the order in which they were filed unless applicant instructs otherwise. If applicant does not wish to have any previously filed unentered amendment(s) entered, applicant must request non-entry of such amendment(s).

a. ☒ Previously submitted. If a final Office action is outstanding, any amendments filed after the final Office action may be considered as a submission even if this box is not checked.

i. ☐ Consider the arguments in the Appeal Brief or Reply Brief previously filed on _____

ii. ☐ Other _____

b. ☒ Enclosed

i. ☐ Amendment/Reply

iii. ☐ Information Disclosure Statement (IDS)

ii. ☐ Affidavit(s)/Declaration(s)

iv. ☐ Other Preliminary Amendment

2. Miscellaneous

- a. ☐ Suspension of action on the above-identified application is requested under 37 CFR 1.103(c) for a period of _____ months. (Period of suspension shall not exceed 3 months; Fee under 37 CFR 1.17(l) required)
- b. ☐ Other Petition for One Month Extension

3. Fees

The RCE fee under 37 CFR 1.17(e) is required by 37 CFR 1.114 when the RCE is filed.

a. ☒ The Director is hereby authorized to charge the following fees, or credit any overpayments, to Deposit Account No. 08-3284

i. ☐ RCE fee required under 37 CFR 1.17(e)

ii. ☐ Extension of time fee (37 CFR 1.136 and 1.17)

iii. ☒ Other Deficiencies only in fees due and payable

b. ☐ Check in the amount of \$ _____ enclosed

c. ☒ Payment by credit card (Form PTO-2038 enclosed)

WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT REQUIRED

| | | | |
|-------------------|-------------------------|-----------------------------------|-------------------|
| Name (Print/Type) | Marianna Fulerer | Registration No. (Attorney/Agent) | 39,983 |
| Signature | <i>Marianna Fulerer</i> | Date | November 10, 2005 |

CERTIFICATE OF MAILING OR TRANSMISSION

I hereby certify that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to: Mail Stop RCE, Commissioner For Patents, P.O. Box 1450, Alexandria, VA 22313-1450 or facsimile transmitted to the U.S. Patent and Trademark Office on the date shown below.

| | | | |
|-------------------|-------------------------|------|-------------------|
| Name (Print/Type) | Marianna Fulerer | Date | November 10, 2005 |
| Signature | <i>Marianna Fulerer</i> | | |

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